551.31
H86

LIBRARY
OF THE
UNIVERSITY OF ILLINOIS

A CASE OF GEOGRAPHIC INFLUENCE UPON HUMAN AFFAIRS.

BY

GEO. D. HUBBARD.

INTRODUCTION.—Among the geologic questions presented within the bounds of Illinois perhaps none has a greater economic bearing than the glacial problem. It is the purpose of this paper to look at glaciation and its results in a limited portion of Illinois, from the point of view of geographic influence upon plants, crops, and animals, and upon man's distribution, occupations, successes, and failures.

From the studies of the glacialist we may learn that during a not very remote period most of the state was invaded by some of the southern lobes of a continental glacier. An early invasion from

43841
P

the north or northeast advanced almost to the southern limits and retreated, leaving a sheet of rock waste spread over the surface. This drift sheet is known as the Illinoian. Another much more recent invasion covered, approximately, one-third of the state in the northeast corner. During a prolonged halt, at its farthest advance, the melting ice freed quantities of material, which formed a large terminal moraine somewhat concentric with the southern shore-line of Lake Michigan.

After entering the state from Indiana just west of Terre Haute the moraine sweeps westward and then northward along a belt south of Paris, Charleston, and Mattoon, north of Shelbyville, west of Decatur and Clinton, and, after crossing the Illinois river at Peoria, runs northward, then northeastward, blending with others at several points before reaching the Wisconsin line. Upon the completion of this great moraine, called, in its southern portion, the Shelbyville system, the lobe of ice, with many halts, retreated northward and deposited over the surface of drift laid down in earlier invasions a heavy sheet of waste called, near the moraine, the Shelbyville till sheet of the early Wisconsin. Thus, there were spread over the area within the encircling terminal moraine two layers of drift, differing in age as much as the time between the two retreats of the ice which deposited them. The lower of these sheets continued beyond the moraine to the farthest limit of the greatest advance of the ice.

The studies embodied in this paper deal with the terminal moraine and a strip on either side of it wide enough to show the characteristics, both of the old and of the new drift; and while it centres in two adjacent counties, the main features of the discussion are applicable to the region near the great terminal moraine from the point where it enters the state from Indiana well toward Wisconsin. In a number of localities the influence of the drift in human affairs has been partly obscured by that of other factors, sometimes geographic, sometimes not.

Many questions of interest have arisen in connection with the work, among which three may be singled out as most fruitful. 1. What was the relief and what were the forms when the ice withdrew and the streams began ? 2. What are the present differences between the old and the new drift and drift forms ? 3. What influence may these geographic differences be said to have upon human affairs ? For the present the first question must be passed over. The second and third have an intimate relation, and since the latter cannot be discussed without at least a statement of the facts of the former, these last questions will determine the succeeding sections of the article.

SECTION I.—CHARACTERISTICS OF THE OLD AND THE NEW DRIFT. The great moraine has been crossed in a number of places, ranging from Amboy in the north to Paris in the southeast, and salient points noted, but the investigations have centered around the region from Shelbyville to Paris. The statistical comparisons are made chiefly between Coles and Cumberland counties. The map (Fig. 1) will show the position of the moraine across these and adjacent counties.

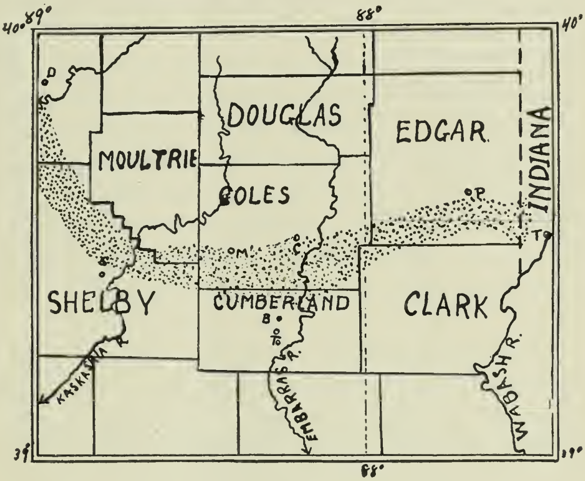

FIGURE 1.

STIPPLED AREA SHELBYVILLE MORAINE.

S = SHELBYVILLE.
B = BRADBURY.
TO = TOLEDO.
M = MATTOON.
C = CHARLESTON.
P = PARIS.
T = TERRE HAUTE.
D = DECATUR.

Throughout all this region very marked differences exist between the new and the old drift forms. Although only twenty years ago geologists had not recognized the relations existing here, there are many farmers who have known for a score of years that adjoining counties were quite different in soil, relief, drainage, and crops.

SOIL AND SUBSOIL.—Probably the transition from old to new drift is most easily recognized from the change in the colour of the soil. That of the older drift is light gray, and contains but little organic matter. The subsoil is of a grayish colour, owing to the state of oxidation of the iron. The soil of the moraine and later drift sheet is dark to black, especially if damp; humus is almost universally abundant. The subsoil is a yellow, gravelly, or sandy clay, passing into blue till below the oxidized zone. The particles of both soil and subsoil are smaller on the south side of the boundary line on similar slopes, presumably due to the greater amount of weathering in the longer period of exposure. The greater degree of fineness is attested on dry, windy days, when the air over the older drift is thick with suspended matter, which may float for a day or more unless forced down by a shower. There are fully twice as many pebbles and boulders in the drift of Cumberland county on similarly situated areas, which means that there were more when the ice first retreated. Those in the moraine and new till sheet are of both igneous and sedimentary origin; but the old drift shows a marked decrease in sedimentary fragments, although both regions are underlain with Coal Measure rocks. However numerous the sedimentary pebbles when the ice retreated, they have had ample time to become disintegrated, for even the igneous rocks are often "rotten" and crumbling. In the new drift most of the specimens of both classes are still sound. These facts largely explain the physical condition of the soil. That of the older or Illinoian is a heavy, rather compact clay, passing below into partially-cemented layers of hardpan; while that of the more recent Shelbyville sheet is a loose, light loam, and much richer in sand.

Dissection.—North of the moraine and upon it, and increasing northward, may be noticed marshes or fresh-water swamps, locally known as *sloughs*, but outside the looping moraine they are almost entirely wanting. The streams have pushed their headwaters back, and have thus claimed nearly all the territory; while within the loop there is much undisputed surface, where water does not run off freely. Many of the marshes have been drained by underground tiling, so that, although the surface waterways are still in a very immature stage, the number of swamps is much reduced. These drained swamps, rich in humus, become within a few years the most valued farming land. Tiling would be useless in the old drift, because the heavy clay soil is so impervious to the water, and it is not much needed, because of the development of the natural drainage. But for crops all through the gravelly soil of the new drift it is a beneficial step.

A further comparison of the valleys on opposite sides of the moraine shows that the little valleys have been pushed back two to four or five times as far from the master streams on one side as on the other. Again, the little valleys are more mature on the old drift than on the new. This comparison must be made at similar distances from the master streams and between streams similar in size. These facts are best seen from unfrequented by-roads or fields, because they have not avoided the rough country so completely as have the best roads. From a commanding point one can easily see that the country is more dissected in the area of exposed old drift—a characteristic brought strongly home to the writer by a hydrographic map of Illinois, one of a series for the Columbian Exposition of Chicago. Most of the common features of a map were omitted, and the streams were printed in black. The increased number of lines for streams south and west of the margin of the new drift gave that portion of the map a darker appearance,

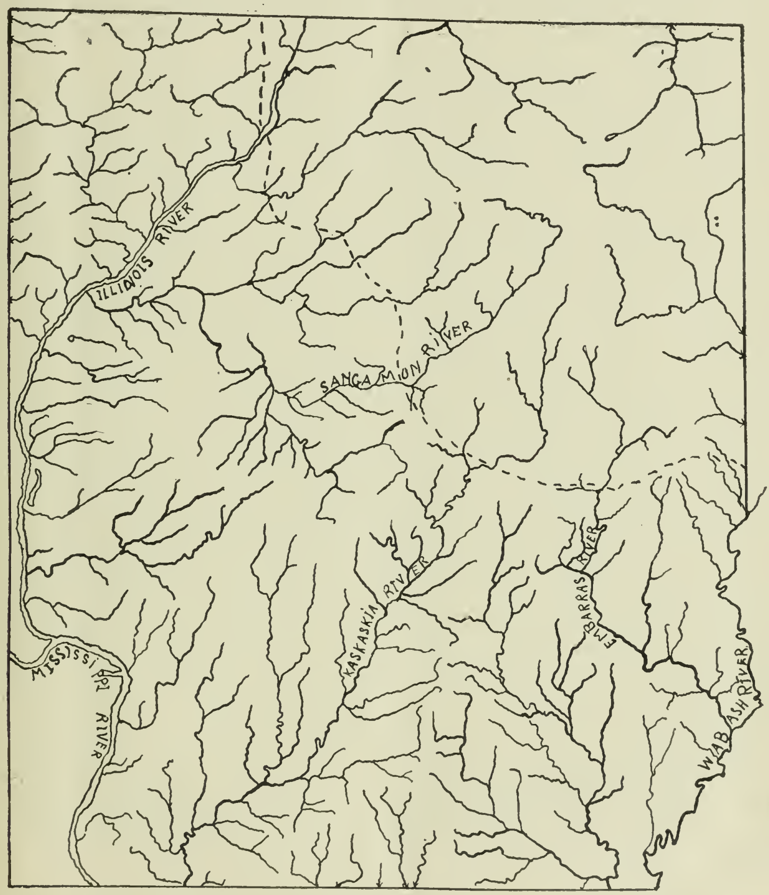

FIGURE 2.

DRAINAGE OF A PORTION OF ILLINOIS. THE BROKEN LINE REPRESENTS THE MEDIAN LINE OF THE LARGE TERMINAL MORAINE.

and the position of the terminal moraine could thus be traced with ease.

Fig. 2 is a reproduction of the drainage from a map of the state in Frye's Complete Geography, special Illinois edition. The moraine was located from Leverett's map in the U. S. Geol. Survey, Monog. XXXVIII. The difference in the development of the drainage system on opposite sides of the moraine may be seen at a glance.

SUBSTRUCTURES.—The story told by the substructures as revealed in outcrops and wells is meagre, but certain characteristics are included here. On Indian Creek, about four miles southwest of Charleston, a bluff, recently undercut, exposes sixty feet of clays and sands, with no rock at the base. About halfway down this bluff the character of the till changes from a rather loose, yellowish-blue, gravelly clay to a more compact, less gravelly gray-blue clay. The line between the two layers can be traced across the exposure by the whiter capping of the older drift; but there is no layer of dark, buried soil, as is the case on the Kaskaskia and in several other outcrops. This boundary is not a straight line; it looks as if the upper layer had been laid down upon a rough, uneven surface of the lower. Similar exposures of two or more layers of till north of the moraine help to characterize the country covered with both drift sheets; while exposures south of the moraine, with only the gray-blue layer, mark the country over which the last sheet of drift was not deposited. Sections in wells furnish similar evidence, where a black soil layer, or wood, leaves, and roots are reported. No exposures with more than one layer have been found on the outer side of the moraine loop, and none without manifest evidence of the yellowish-blue layer above the gray-blue within the loop. These features may be held to characterize the old and the new drift. On account of the partial consolidation producing "hard-pan" in the under layer, well-diggers find easier work in the recent till sheet.

Ice-fronts in the moraine belt still well preserved, and the absence of any semblance of such a structure outside, furnish another set of characteristic features. Ice-fronts are not found on the more level till sheet north and east of the moraine, but belong to moraine belts only.

Approaching the Shelbyville moraine along a light-coloured, dusty road across the older drift sheet, one sees the moraine rising as a hilly belt fifty to seventy feet above the more level earlier till plain. It looks like a huge dumping-ground. The continued action of rains, frosts, and surface water has rounded off the hummocks, and more or less blended them together. On the other hand, in travelling southward or westward, as the margin of the moraine is approached a vast plain is spread out in view, fifty feet or more below. In tracing the line of contact of the old and new drift many local irregularities are found; sometimes one may identify the two sheets at points a hundred feet apart, but usually it is good work to locate the line within a quarter of a mile. Overwash materials help to mask the boundary, and the line is not straight, but swings in and out. In valleys or low lands the ice seems to have advanced a little farther; while on the higher lands it appears to have been held back a little. (See map, Fig. 1.)

ALONG THE RIVERS.—Embarras river, where it crosses the new drift, usually flows in a post-glacial gorge. This gorge is about one hundred feet deep across the moraine, less deep further north, and is cut in boulder clay nearly all the way; but occasionally the stream, missing the old channel, has cut down into bed rock. This narrow valley has a correspondingly narrow and elongated basin in the region north of the moraine, in part because other streams are near and in part because the headwaters have not claimed all possible territory. Southward in the region of the old drift, the wider valley formed before the Wisconsin drift sheet, and partly filled with overwash materials of Wisconsin age, can easily be traced.

This overwash or valley train partially filling the old valley with drift, usually pretty well sorted, has been cut into by the stream to a depth of about thirty feet, leaving a series of terraces. (See Fig. 3.)

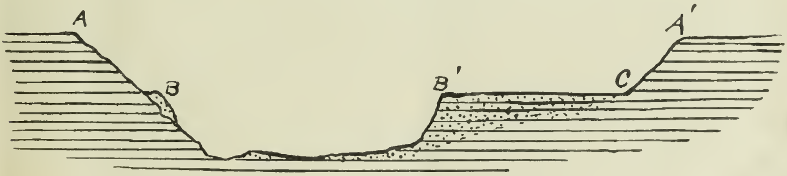

FIGURE 3.

CROSS-SECTION OF OLD AND NEW VALLEYS, THE LATTER WITHIN THE FORMER, JUST SOUTH OF THE MORAINE WHICH CROSSES EMBARRAS RIVER. A–A', BLUFFS OF OLD VALLEY, 1¼ MILES APART. B–B', BLUFFS OF NEW VALLEY, ½–¾ MILE APART AND RISING 30 FEET ABOVE THE STREAM BED.

The old valley is often a mile in width, and from its crest to the bottom of the inner channel more than fifty feet deep; but the stream has not yet cut through the filling, except where it crowds close underneath the bluffs of the old channel. The post-glacial channel varies in width from a half to one mile, and very rarely lies at all beyond the confines of the older valley. The river, in swinging from side to side, has reached the east bluff in several places, but has not yet disturbed the west bluff. Hence remnants of the surface of the glacial filling are quite continuous for miles on the west side (B′–C, Fig. 3); while they are very fragmentary on the east side (B, Fig. 3). This terrace top is locally known as the "second bottoms," here as in many places in Illinois, in order to distinguish it from the lower present bottoms, or "first bottoms." It is considered superior to the uplands for farm crops, but inferior to the lower bottoms. Practically, all of this terrace seen in the Embarras, and it extends eight or ten miles beyond the moraine, has a front in one step dropping down to the present flood plain. There are similar terraces in gravel trains along many streams in Illinois, where they have just emerged from the terminal moraine into the older drift; and since they do not, and from the nature of the case cannot, occur within the moraine loop, they furnish one more characteristic feature of the old drift. It is unfortunate that so little study has been made of these terrace forms, for they are really common along the streams leading outward across the terminal moraine of the early Wisconsin sheet.

Section II.—The influence of these geographic conditions upon values, crops, people, industries, and commerce.

The people dwelling within the loop of the great moraine speak of the southern portion of the State as *Egypt*, and of their own portion as *God's country*. So characteristic are the features of the regions on the two sides of the boundary that all classes of men recognize their unlikeness.

A land agent is authority for the statement that the northern three rows of sections of Cumberland county are worth more than all the rest of the county. These three rows of sections constitute all the land in the county which is not of the older drift, except patches of bottom lands. Real estate men and landholders recognize the geographic boundaries between good and poor land. Geographic influence is a reality which may be expressed in standard terms of value. The records of land transfers, except in the river bottoms, show the average price of land south and west of the great Shelbyville moraine to be not more than $30.00 per acre; many farms sell as low as $15.00; a few for $40.00. North and east of the moraine through many counties the land brings from $75.00 to $125.00 per acre, rarely less than the lower figure, and occasionally more than the higher. But to the cultivator geographic influence is as real a thing as to the taxpayer. Crops are not the same on opposite sides of the moraine, and on account of the nature of the soil the plows used are of different quality. On the south in Cumberland and adjoining counties lies a region producing timothy hay. Possibly a third of the land is mowed annually. Owing to the large acreage and the smoothness of the country, machinery is extensively used. Straight, round haystacks, in groups or scattered, dot the meadows; rarely is there a hay barn to be seen. Next to hay, stock—cattle and sheep—is the most important product, but many of the cattle are driven a few miles north to be fattened, or are fed with grain from across the moraine. Again, timber is not as scarce in *Egypt*, because the soil is not considered worth clearing for cultivation, and the trees are left in possession. Corn and oats are grown, but are very poor crops compared with those on the new drift. Broomcorn is often tried, with poor success. On the contrary, within the moraine loop is found a characteristically different group of crops. Hay for commerce is rarely grown. Most farms produce enough for their own use, and usually the local markets are supplied from the neighbouring farms. Because of the limited acreage hay-harvesting machinery is little used. Clover hay is more common than timothy. The haystack is rarely seen, because the crop is stored in barns. Corn and oats are the dominant crops, with good and occasionally prodigious yields. The stock is fat, and well fed with the output of the farm. Timber is rarer because the rich soil was worth more for cultivation. Broomcorn in Coles and Douglas counties is a leading crop, and these two counties produce a very large percentage of the total output of the United States. The difference in the quality on opposite sides of the moraine is probably more conspicuous in the case of broomcorn than in that of any other crop. Why such differences in the quality of similar crops? According to the Department of Agriculture, Bureau of Soils (Bull. 22), the economic distribution of crops is dependent mainly upon the physical characteristics of the soil and upon climate. If, as the experiments of the Bureau seem to show, there are but two chief factors, then the physical characteristics are the determining causes of these noted crop dissimilarities, because in two small, adjacent, similar areas the climate is essentially the same.

A table of facts, concerning yield and value of crops in two adjacent counties, has been compiled from the Statistical Atlas of the Twelfth Census, and is inserted here to show the relative strength of Coles and Cumberland counties.

COUNTY.	CORN IN BU. PER ACRE UNDER CORN.	WHEAT IN BU. PER ACRE UNDER WHEAT.	OATS IN BU. PER ACRE UNDER OATS.	HAY IN TONS PER SQ. MI. FOR ENTIRE COUNTY.	TOTAL VALUE OF FARM CROPS PER SQ. MI. FOR ENTIRE COUNTY.	VALUE OF CROPS PER ACRE OF IMPROVED LAND.
Coles	30–40	7–14	36 and over.	75–100	$5,000 and over.	$10–15
Cumberland	20–30	less than 7	20–28	100–150	$2,500–5,000	$6–10

According to the same authority, Coles also outranks Cumberland in cattle and swine, but both are similar in horses and sheep.

One is struck with the comparative degree of thrift apparent in each of the two regions. Outside of the moraine many log houses are still in use; while on the inside they have, almost without exception, been replaced by commodious modern dwellings. Buildings are in much better condition—are larger, more convenient, and more numerous within the moraine loop. Abandoned houses are occasionally seen through this district, but they are much less numerous than in the district floored with the older drift. The reasons for abandoned houses are at least two: 1. The owner of the farm has built a new dwelling and has left the old one standing. 2. The partial abandonment of poor farms and the consequent consolidation of two or more under one management. The resident displaced by this means usually leaves the region. In that case the division of farms near towns and their intensive cultivation, together with some centralization of population in the towns, maintains the total population of the entire region from census to census; but the unproductiveness of the farms is an important factor in this last consideration.

The density of population differs remarkably in adjoining counties lying on opposite sides of the outer boundary of the moraine, as is seen in the case of Coles and Cumberland counties in the table below. In 1890, Coles had thirty per cent. more people

COUNTY.	DRIFT.	AREA.	POP. 1890.	DENSITY PER SQ. MI.	POP. 1900.	DENSITY PER SQ. MI.	PERCENTAGE OF ILLITERATES.
		SQ. MI.					
Coles	New	520	30,000	57.7	34,146	65.6	2.24
Cumberland	Old	350	15,443	44.1	16,124	46.1	3.58
Dewitt	New	406	17,011	42.0	18,972	46.7	2.21
Logan	Old	610	25,489	41.6	28,680	47.0	4.60

to the square mile than Cumberland; and in 1900 forty-two per cent. more. If a similar comparison be instituted in the adjacent counties to the east, Edgar and Clark, it will not be found to work as well, because the moraine, whose area belongs with the new drift, covers much of Clark county. Furthermore, Clark has productive bottomlands along the Wabash river. These two advantages place Clark almost on a par with Edgar as to density of population. In 1890 the difference was well marked, but greater development of the bottoms since has balanced up the population. Probably, if the census were sufficiently refined as to minor districts, a comparison of adjacent areas on opposite sides of the moraine might show results tallying with those in the Coles–Cumberland case.

The figures in the table above show the relative standing of two other counties. In spite of the fact that Dewitt has no coal workings, while Logan has coal sufficient to employ several thousands of men, yet Dewitt practically equals Logan in density of population because of its greater soil resources. This, like the Edgar–Clark case, brings out an element which must be reckoned with in the study of results due to complex causes. The geographic distribution of coal, as of any mineral product, is a factor in determining density of population and occupations which here all but obscures the influence exerted by glaciation and subsequent erosion. It is possible for the distribution of coal to be such as not only to obscure the other influence, but to overbalance it, thus introducing an apparent contradiction, until the causes are analysed. But even the distribution of mineral wealth is a geographic factor. In the selection of Coles and Cumberland counties for comparison, a fairly successful elimination of factors other than the one under consideration has been made by nature. Neither county has coal or other valuable mineral deposits; neither has manufactories, except those dependent upon some product of the region, as clays, sorghum, and broomcorn, or those required by the local needs. And no factories except those for making brooms have distant markets. On the other hand, if all crops grown in each county were manufactured in the producing county, certainly the density of population in Coles would undergo a considerable relative increase. In the table concerning population the percentage of illiteracy is entered for each of the counties, bringing out a marked contrast. It is probable that the large proportion of coal miners, mostly foreigners or negroes, is responsible in a measure for the high percentage of illiteracy in Logan county. There is very close agreement between Coles and Dewitt counties, situated in similar geographic conditions—a correspondence which is at least suggestive.

In the comparison of relative density of population another point may be noted, revealing a physical influence upon occupation. According to the Twelfth Census, Coles county has business enough to support 16,000 of its 34,000 people in towns of about 1,000 persons and upward; while Cumberland has about 3,000 out of its 16,000 people in towns. In the former only about one-half of the entire population lives directly from the soil, permitting the second half to engage in other occupations; while in the latter county four-fifths of the population must till the soil and only one-fifth finds other employment. The contrast is more marked when it is remembered that there are but about two-thirds as many persons to the unit area in Cumberland as in Coles county.

The relative value and importance of exports and imports pertaining to adjacent areas on opposite sides of the glacial boundary seem to confirm the general argument, but figures are wanting.

The influence of environment is clearly felt in road and railroad construction, and is so different in its results as to admit of easy comparison. The abundance of gravel in the hills of the moraine reduces the cost of roads, and there are, accordingly, many miles of well-gravelled roads in Coles county, especially in the southern half. In Cumberland there is very little available road material, and the heavy clay makes good roads possible without gravel. Away from the moraines of the new drift there is little gravel, and the roads, over the black, sticky, rich earth, become in rainy weather almost impassable. North and east of the moraine railroads cost less for grading, cutting and bridging than they do south and west of it. The greatest expense for these items is where the road is laid among the morainic hills.

Conclusion.—Well does Professor Davis say*: "The vanished ice sheets are of greater importance in American geography than are the Indians in American history." We cannot accurately tell what would have been the condition of the country had the glacier not visited it, but upon the glaciated parts we can see that the effects vary greatly even within narrow territorial limits. Whatever the origin of the so-called Illinoian drift and whenever it came with reference to the Wisconsin sheet, the present geographic conditions on opposite sides of their common boundary have given rise to differences in crops and in values, in the cost and facility of road and railroad construction, in the occupations and thrift of the inhabitants, and even in the distribution and density of the population.

---

*Text book in Physical Geography, p. 346.

Cornell University.

3 0112 061416076